GLAST Calorimeter Mechanical Systems

Working Group Meeting

Status

- Delivered Hardware
  - EM Structure
    - Base Plate
    - Composite Structure
    - Top Frame
- Pending Hardware
  - EM Structure
    - Side Panels – Fabrication
    - Close-Out Plates – Redesign
    - Bumper Frame Assemblies - Redesign
    - Flight Fasteners – On Order
  - Mechanical Ground Support Equipment
    - CDE Insertion Tooling – Fabrication Complete
    - PEM Assembly Tooling – Design Complete
    - Handling Fixture – Design Complete
    - Rotation Fixture – Minor Modifications to Existing Design
    - Shipping Container – Preliminary Design
    - TVAC Test Fixture – Preliminary Design
    - Vibration Test Fixture - Scheduled

Status - Continued

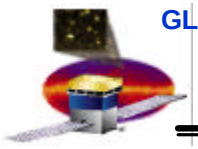
- EM Reports
  - Stress Analysis – Delivered
  - Thermal Analysis – On-Going
  - Structure Acceptance Data Package - Delivered
- EM Assembly Procedures
  - CDE Insertion Procedure – Under Development
  - PEM Assembly Procedure – Scheduled
- EM Test Plans
  - Thermal Vacuum Test Plan - Scheduled
  - Vibration Test Plan - Scheduled

Issues and Concerns

- Base Plate Modifications Requested by SLAC
- Close-Out Plate Redesign
- Bumper Frame Redesign
- Composite Structure Cure Process
- Composite Structure Verification Testing
- Calorimeter Module – LAT Grid Integration

Base Plate Modifications

- Base Plate Modification Requested by SLAC for the Following Reasons:
  - High Stiffness of Base Plate Drives Peaks Loads of Bolts Connecting the Calorimeter Modules to the LAT Grid
  - Maximize Friction Characteristics of Bolted Joint
- Requested Base Plate Modifications Are:
  - Increase Length of Tabs by Deepening Notches Between Tabs and Lengthening Tabs
  - Decrease Thickness of Base Plate
  - Reduce Corner Radius of Tabs



Base Plate Modifications - Continued

- Consequences of Required Modifications to the Base Plate
  - Base Plate Modifications Will Decrease its Stiffness and Potentially Increase Loads into the Inserts of the Composite Structure as well as the CDEs.
  - Current Test and Analysis of EM Will Be Invalid
  - No Room in Current EM Schedule to React to Major Modification of the Base Plate

- Proposed Plan if Modification is Required
  - Continue with Current EM Assembly and Test Schedule
  - Re-Run Stress Analysis to Evaluate the Results of the Modifications on the Structure
  - Modify Base Plate for EM2 Assembly and Re-Test

Base Plate Modifications - Continued

- Disadvantages of Modifying Base Plate at EM2 Level
  - Impact of Base Plate Design Modifications to CDE and AFEE Are Unknown
    - All EM CDE and AFEE will be tested in Previous Stiffer EM Structure
    - Reactions that CDE and AFEE Will Actually Experience with Modified Base Plate Design Will Not Be Confirmed Until the QM is Qualified
- Disadvantages of Modifying Base Plate at EM Level
  - Cannot Meet the Current Assembly and Test Schedule
  - No Time to Analyze and Evaluate the Structural Effects of Modifying the Base Plate Design
  - No Time to Analyze the Impact of the Base Plate Design Modifications to the CDE and AFEE
- Advantages of Modifying the Base Plate at the EM Level
  - CDE and AFEE Will Undergo Environment Testing Within a Structure of Realistic Flight-Like Stiffness

Close-Out Plate Redesign

- Close-Out Plate is Undergoing Redesign to Accommodate the AFEE Redesign
  - Current Plate Interface to Primary Structure Remains Unchanged
  - Openings for Electrical Interconnects between the CDE and AFEE Redesigned
    - Changed Opening Shape from Slot to Hole to Accommodate New Electrical Connections
    - Changed Position of Openings to Accommodate New Wire Position Relative to Position of AFEE Components
  - Incorporated Stiffeners to Minimize Deflection without the Need to Change the Material

Bumper Frame Redesign

- Considering a Change in the Bumper Frame Design to Incorporate an End-Cap
- Past Bumper Frame Designs
  - Initial Bumper Frame Design
    - Clearance Between Frame Opening and Bonded PIN Diode was Marginal Due to Positional Errors of the Bonded PIN Diode due to Crystal Surface Profile Tolerance
  - Bumper Frame with Spacer
    - Solves Marginal Clearance Between the Bumper Frame and the Bonded PIN Diode Through the Use of a Spacer
    - Relies on the Ability of the Bumper Frame to Slide over the Spacer

Bumper Frame Redesign - Continued

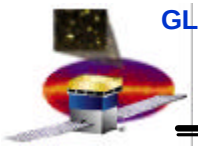
- Advantages of End-Cap Design
  - Allows More Clearance Margin Between the Frame Opening and the Bonded PIN Diode than the Previous Designs
  - More Forgiving in terms of the PIN Diode Bonded Position Errors from Crystal Surface Profile Tolerance
  - Provides Physical Hard-Stop Between the Wrapped CDE and the Walls of the Composite Structure
- Disadvantage of End-Cap Design
  - Fabrication is Very Labor Intensive

Composite Structure Cure Process

- Composite Structure Cure Process is Being Improved in Order to Produced Consistent Cured Structures for the Flight Build
  - EM Build Validated the Following Procedures:
    - Pre-Preg Cutting Procedure
    - Pre-Preg Lay-Up Procedure
    - Ability to Hold Proper Cure Temperature
  - EM2 Build Will Validated Cure Process
    - Ability to Control Proper Application of Pressure During the Cure
    - Performance of the Improved Molds for Autoclave Use

Composite Structure Cure Process - Continued

- EM2 Fabrication
  - Composite Structure Fabrication is Scheduled for January 2003
  - Fabrication of Aluminum Piece-Parts Currently Not Scheduled
- EM2 Environmental Testing
  - Abbreviated EM Test Flow
  - EM2 Will Be Populated only With CDE and AFEE Mass Simulators



Composite Structure Verification Testing

- Because the Material Properties for Composite Structures are Dependent Upon the Consistency of the Fabrication and Curing Process, Verification Testing is Required
- MIL-STD-1540D Requires All Composite Structures Be Verified by Static Proof Load. However, a Sine Burst Test is Currently Baselined Due to the Following:
  - No External Interfaces to Attach Static Proof Load Fixtures
  - Proper Loading of the Composite Structure Requires a Distributed Inertial Load from the CDE Mass

Composite Structure Verification Testing - Continued

- Verification Testing in the Assembly and Test Flow
  - Should Be Scheduled Before Integration of the CDE and AFEE Components
  - Currently Scheduled to Occur During Environmental Testing Due to the Tight Schedule
    - Dependent Upon Confidence in Consistency of Composite Structure

CAL Module – LAT Grid Integration

- CAL Module Integration to LAT Grid Integration Concept
  - Inverted Insertion of CAL into LAT Grid
  - Alignment Assured Using the Following Alignment Tooling:
    - Guide Rods Attached to Adjacent MGSE Base Plates or CAL Base Plates
    - Alignment Fixture Attached to the Integration CAL Module
  - CAL Module is Lowered Using Crane and Alignment Tooling
- Mock-Up Test Currently Schedule for Early November to Verify
  - Ability To Insert the CAL Module into the LAT Grid in the Inverted Position
  - Ability of the Alignment Tooling to Maintain Proper Alignment Required to Clear the 0.7 mm Space Between LAT Grid Walls and CAL Module